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ABSTRACT

Progress in realizing the full potential of computerized data processing is being hindered by costs and by the spread of a multitude of small, independent computer facilities. There is a need for some uniformity of specifications among the various systems. The result would be a compatibility that could help to reduce costs more rapidly because of the larger unit size. Such a uniformity would also provide the smallest and most remote district with access to the same wealth of data and services as it provides the largest urban area. This review surveys some of the many specific tasks that can be carried out by computers to assist school administrators in fulfilling their professional responsibilities. It examines the concept of regionalism in developing computer facilities and suggests that such centers are ultimately more a boon than a threat to local personnel. It is control of the electronic data processing units within organizations, rather than merely the centralization of facilities, that presents the real issue to be faced. (Author)

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# Computerized Data Processing

Warren Mellor

> Every school system should be concerned with the educational innovations that are evolving through the invention of man-made machines of the last ten years. Machine systems are here to stay and will increasingly affect all types of educational agencies in the years to come. These systems have demonstrated their potentialities to do much in providing services and information heretofore only achieved by countless hours of teachers' and administrators' time working on reports and figures essential for the efficient operation of schools .... The machines are only limited by the manager's ingenuity in utilizing the potential of the machines available to him.
>
> *Nelson and others (1968)*

The application of computer technology to the tasks of data processing foreshadows a virtual revolution in school administration. Now all schools can have access to facilities that assist in carrying out, with speed and efficiency, not only the routine mechanical tasks attached to running a school or a school district, but also the most complex associated management functions.

Progress in realizing the full potential of computerized (or electronic) data processing is being hindered by costs (though they are declining), and by the spread of a multitude of small, independent computer facilities. There is a need for some uniformity of specifications among the various systems. The result will be a compatibility that helps to reduce costs more rapidly because of the larger unit size. It will also provide the smallest and most remote

district with access to the same wealth of data and services as the largest urban area.

Such centralization of facilities, first on a regional level, and then on a state (and federal) level, need not be the threat to local autonomy that some would have us believe. Indeed research is now under way to examine the degree to which centralized information and data processing systems actually may enhance local decision-making powers.

This review surveys some of the many specific tasks that can be carried out by computers to assist school administrators in fulfilling their professional responsibilities. It examines the concept of regionalism in developing computer facilities and suggests that such centers are ultimately more of a boon to local personnel than they are a threat. It is control of the electronic data processing units within organizations, rather than merely the centralization of facilities, that presents the real issue to be faced.

Of the documents reviewed, thirteen are available from the ERIC Document Reproduction Service. Full details for ordering are given at the end of the review.

## The Potential of Computers

Electronic systems of the future are bound to be larger, faster, and more reliable (Hammer 1972). They will furnish management with uninterrupted services for practically all applications. In short, they will provide computing power as a utility company of today provides electric power. But the most spectacular advance is likely to be the introduction of millions of terminals into offices and even homes, allowing most jobs to be done when and where they need doing. Thus, electronic systems will eventually take on practically all the tasks of rote and drudgery we now have to do.

Educators, too, need to be aware of the potential of electronic data processing (EDP) in their field. Goodlad and others (1966) set out the routine uses of EDP for business and student accounting, as well as its innovative uses in instruction. They describe computers and electronic accounting machines and provide case studies of their applications. In addition, they attempt an evaluation of the potentials and limitations of EDP in such school situations as general business accounting, instructional programs, educational information systems, research and experimentation, and computer science.

## Computer Services

The advantages of computer applications are now available to any size school district through a variety of computer sharing plans (California Association of School Business Officials 1970). Computers, for example, can perform many of the functions for purchasing operations. They can be programmed to write purchase orders, and to maintain equipment and vendor inventories. They can control equipment acquisition, transfer, and retirement. The use of computers for routine procedures thus frees the purchasing agent for a more creative role in administration.

The manual attendance accounting system now employed in schools can be replaced by an automated accounting system (Chapman and others 1971). Data are applied to a computer from several different terminals. In this way, school administrators can not only monitor simple attendance but also obtain a variety of

additional information on the student body. Moreover, this style of automated system removes the need for governmental auditing procedures because the system design is, in itself, so accurate.

A computerized procedure produced more efficient bus routes with considerably reduced time and effort when school districts in the province of Ontario were reorganized (Tracz and Norman 1970).

In regard to budgeting, the National Educational Finance Project has developed a computerized model designed to simulate the consequences of alternative decisions in the financing of public elementary and secondary education (Boardman and others 1971).

Bratten and others (1968) describe the design and initial trial phase of a project to develop a computer-based budget planning system for school districts. From a teletype at the district office linked to a central computer system, an administrator can retrieve specific portions or summaries of a prestored description of his personnel. In addition, he can prepare alternative budgets at the teletype by modifying factors such as the salary base of the salary schedule.

A major difficulty in predicting school enrollments has been the failure of the forecaster to express adequately his degree of certainty in his estimates (Denham 1971). To alleviate this problem, a basic method of enrollment prediction was chosen that requires separate estimates for such variables as migration, retention, and transfer. The method was then modified to require three estimates (high, low, and most likely) for each variable. A Monte Carlo computer simulation program combines these various estimates, resulting in the preparation of probability distributions of enrollment predictions.

## Regional Computer Facilities

Computer-based management information systems contribute to educational decision-making in that they can contain not only all the data within a total organization, but can refine and arrange the information so that it becomes meaningful to the administrator (Evans 1970, Mellor 1973). Even though costs are dropping dramatically, however, use of computerized data processing facilities is still beyond the reach of any but the biggest districts. For this reason, many superintendents are cooperating in the development of regional centers and are finding that costs are reduced without interference to local autonomy.

Districts with less than 1,500 students require no electronic data processing services of their own, according to a study reported by Drozda (1968). The purpose of the study was to evaluate the data processing needs and resources, not only of local school districts but also of regional data processing centers. The types of services, including programming packages, that would be offered by the regional data processing centers were also examined. Recommendations are that regional data processing centers should be established on an experimental basis and (at least initially) be under local control. County centers should be selected as regional sites.

A study reported by Nelson and others (1968) sought to determine the feasibility of establishing a central data processing service by the Wabash Valley Education Center for its member schools. Although sizable capital outlays are required to establish a data processing center, manual

data processing activities carried out by local schools can be eliminated and more services provided. Therefore, the study recommends that

- Highly competent and capable staff should be developed for the data processing division.
- Hardware configuration should be based on the types of services to be provided.
- In planning operations, highest priority should go to the least complex services.
- Primary attention should focus on completeness and accuracy of output before it is disseminated.

Farquhar (1972) summarizes six reports concerning the design of a computerized information system to aid the Los Angeles city schools in implementing accountability and program budgeting (see also Farquhar and Boehm 1971, Rapp 1971, Donaldson 1971, Farquhar and others 1971, Dougharty and Haggart 1971). The information subsystem maintains timely data on all employees and volunteer personnel, program and budget, educational results, and community characteristics. An inquiry subsystem supplies information specifically requested—exception reports that show atypical attendance, achievement, or expenditures; recurring historical reports; and inquiry reports. Thus, although the system is on the one hand centralized, on the other it focuses on the individual school principal in allocating responsibility for decision-making and accountability.

A Planning and Management Information System is at present being implemented in the Dallas Independent School District, Texas (Council of the Great City Schools 1972). The intention is to make the system available also to other districts. PMIS is a computer-based system that helps top management make more effective decisions by providing them with accurate and timely information. Thus it supports the decision-making process in specific functional areas by assembling, sorting, and retrieving information. It supplies specific information to management for strategic planning, comparability studies, equal education planning, fiscal resource studies, and preparing state, local, and federal reports.

PMIS has four interrelated subsystems:

1. a data base subsystem, made up of current records (Student I), five year historical records (Student II), annual entries for school characteristics, programs, facilities and staff (Student Support), and district demographic and financial characteristics (School Support)
2. a data acquisition subsystem, the source being the school system itself and other PMIS data bases
3. a reports subsystem by which users can construct their own queries using any of five languages, or rely on a library of preprogrammed routines for calling up reports. A special data base, REPORTS, catalogs these reports
4. an internal control subsystem that contains the procedures and commands used by the other subsystem

The Oregon Total Information System (OTIS) provides student, business, and instructional services to fifty school districts (Hoag 1973, Mellor 1973). On-line questions regarding information in files can be asked by GEMS (General Education Management System). Integration of five data files allows OTIS to manipulate and select appropriate information for educational decision-makers.

## STATE INVOLVEMENT

Management information systems and planning-programming-budgeting systems are being developed side by side in state education agencies (Bliss 1971). Most states have begun to implement information and PPB systems, but they are hindered by lack of both funds and experienced personnel. Bliss recommends that state agencies place greater emphasis on information and PPB systems development and that federal agencies provide more assistance to state and local education agencies.

The California Education Information System (CEIS) was developed to provide integrated information processing for educators at every level of operation (Howe 1972). The objectives of CEIS are to make available, through a statewide system, complete, current, and reliable information about education at the local and state level. Such information is intended for local district use. CEIS thus provides a flexible and comprehensive means of obtaining better information for the management of educational programs. At the same time, CEIS automates most of the routine information processing. The business subsystem currently includes five applications: control, accounts payable, stores inventory, personnel/payroll, and financial. The pupil subsystem is divided into nine applications: process control, master file maintenance, attendance accounting, mark reporting, test reporting, California guidance, educational planning, student scheduling, and master schedule builder.

A recommendation is made by the Association for Educational Data Systems (1970) that state departments of education attempt to bring uniformity to educational information and to its form of maintenance. A report describes some of the information items presently maintained by various state departments and by certain large school districts. It surveys the data that are maintained, the nature of the information itself, the years for which it has been maintained in current form, the equipment used, the time of collection, the level of aggregation, the type of school, and the educational range. The report also categorizes the information items and lists the number of state departments of education maintaining information for each item on hard copy, punched cards, or magnetic tape.

## EDP IN AN ORGANIZATIONAL SETTING

It is important to remember that there is no one best way to integrate EDP or MIS into an existing organizational structure. Arrangements are the product of a unique set of organizational variables (Hebden 1971). Centralization is only one possible response. The major organizational and management problems arising from electronic data processing are the result not of the machinery (computers) but of the departmental function EDP serves and the organizational location it holds. Difficulties will arise to the extent that the "distance" of organizational personnel from the EDP unit is enlarged by senior management, by middle or line management, and by the EDP department itself. Such distance will be minimized if one remembers that the EDP unit

- relies for its existence on ability to handle other people's information
- implies criticism of the existing system in its promise to "improve" or change that system

- must survive in a social environment, dependent on the goodwill of others to provide its data
- cannot be concerned with information other than that central to the organization's function

In this sense, the "threat" posed by such systems may be overestimated. A report by the New York State Department of Labor (1968) presents the findings of a survey of personnel changes resulting from the installation of electronic data processing equipment. Data were gathered from about 50 percent of all workers in establishments with EDP installations in 1962-63. The survey found that staffing of EDP units was largely accomplished by utilizing existing employees rather than by recruiting from outside sources. About 25 percent were newly hired personnel. In most transfers (the remaining 75 percent) skill requirements remained about the same. There were some instances of upgrading, but downgrading rarely occurred.

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